REMARKS

Claims 1 - 67 remain active in this application. The indication of allowability of claims 2, 3, 10, 15, 24, 28, 29, 35, 41, 49, 52 - 54 and 65 - 67 is noted with appreciation. Claims 1, 27, 55, 57 and 64 have been amended to improve clarity. The specification has been reviewed and editorial revisions made where seen to be appropriate. No new matter has been introduced into the application. Support for the amendments to the claims is found throughout the application as originally filed, particularly in Figures 2, 3 and 7B and the description thereof on pages 12 - 20 and in the Abstract.

It is noted for the record that the office action of June 21, 2004, is silent in regard to the drawings of this application. This application was filed under 35 U.S.C. §371 and included a copy of the PCT application, including formal drawings. No objection to these formal drawings has been raised in the present office action and it is therefore assumed that the drawings are acceptable. Accordingly formal acceptance in the next office action is respectfully requested.

It is also noted for the record that the present office action indicates that it is in response to a communication filed January 7, 2004, although it does not appear from the file of the undersigned that any communication was filed in this application on that date. By a telephone call to the Examiner on June 23, 2004, it was confirmed that no communication was filed in regard to this application on that date and that the notation in the present office action was in error.

Claims 1, 4 - 8, 11 - 14, 16 - 23, 24 - 27, 30 - 34, 37 - 40, 42 - 48 50, 51, and 55 - 64 have been rejected under 35 U.S.C. §102 as being anticipated by Jacobs. This sole ground of rejection is respectfully traversed. It is respectfully submitted that the

Examiner's comment that Jacobs is "*considered as* a central pattern generator-based system" is not substantively well-taken and literally admits the impropriety of the rejection for anticipation.

While Jacobs is certainly directed to the field of robotics and robot motion such as walking and generally seeks to simulate some biological structures and thus discloses structures which are "biologically-inspired", it is substantially irrelevant to the present invention, as claimed. The "biologically-inspired" structures disclosed by Jacobs and reference to "neurophysiological features" are at the level of artificial muscle-like actuators and their control using a computer using a rule-based "if-then" or "fuzzy logic" algorithm processing feedback information provided by sensors for control of generation of commands in accordance with "if-then" logic rules. In sharp contrast, the present invention seeks to simulate neurons of a type which provide repetitive motion and which are capable of doing so without input information (although capable of receiving and utilizing input information to adapt the repetitive action commanded), regardless of the mechanical constitution of the robot or portions thereof; an approach to robotic motion at an entirely different level of abstraction as tho which Jacobs is completely silent.

More specifically, to understand the approach to robotic motion underlying the invention, the concept of a central pattern generator (CPG) simulated by the invention must be fully appreciated. As disclosed throughout the application, a biological central pattern generator is a group of cells which exhibits the defining feature that, in the absence of peripheral (e.g. sensory) input, it is capable of autonomously producing a detailed pattern of activity sufficient to support locomotion or some other generally repetitive action such as respiration or heart action but can

accept input such as sensory signals to regulate or
self-adapt particular features of the repetitive action
and thus tune the behavior of the biological CPG. The
existence of a biological central pattern generator has
been demonstrated and is well-established for insects
but is only inferred (e.g. from evolutionary arguments)
in regard to humans due to the ethical problem of
depriving the spinal cord of sensory input in a manner
which assures that no sensory input is received by the
spinal cord. Essentially, a biological CPG is composed
of oscillatory neurons which can function in the
absence of input but can accept input to tune behavior.

The invention, as claimed, includes a non-
biological CPG which is, by definition, capable of
autonomously providing signals for controlling a
rhythmic or repetitive action and, in a preferred form
(e.g. as illustrated in Figures 2 or 3), comprises an
oscillator or a plurality of oscillators which can be
controlled in frequency, phase and/or other output
signal parameters by signals which adapt its behavior.
In sharp contrast, the processor of Jacobs must develop
each command for controlling a complex movement in
response to feedback signals causing the processor to
advance from state-to-state (Figure 10, illustrating a
sequence of commands for walking, is referred to as a
state diagram at column 12, line 55) to provide the
necessary sequence of commands. Each command is
conditioned on feedback as is particularly evident from
the use of "if-then" rules for controlling the
production of commands. In summary, the invention thus
does not involve data processing in accordance with
rule-based algorithms for control of complex robotic
motion but, rather, simulates the biological CPG by
providing circuits which operate autonomously with
their behaviors adapted by input signals thqat5 are not
otherwise necessary for autonomous operation of those
circuits.

Moreover, Jacobs explicitly uses the phrases "biologically inspired" and "anatomical and neurophysiological features" to refer generally to "features which exhibits (sic) self-limiting, mechanical constraints" (see, for example, column 2, lines 36 - 51 and 62 - 67) and specifically to artificial muscles, tendons, limbs and joints. Jacobs is completely silent in regard to simulation of biological neurons or a CPG which is defined, in both substance and in function, as an autonomous neural circuit. Therefore, while Jacobs may ultimately produce command signals which are somewhat similar to those produced by the invention those signals are produced by a markedly different instrumentality and in a much different way (e.g. in response to "if-then" logic and processing of feedback signals rather than operating autonomously and using inputs to adapt the autonomous behavior of the non-biological CPG and the simplicity and autonomous action of non-biological CPG of the invention supporting not only real-time response to input signals but the extremely small size and low power requirements of the invention, particularly as compared with a data processor such as that of Jacobs) such that the processor of Jacobs could not remotely be considered even as an equivalent of the non-biological central pattern generator recited in the original claims of the application, much less anticipating a non-biological CPG capable of accepting inputs. Accordingly, it is respectfully submitted that the ground of rejection based on Jacobs is clearly in error in view of the Examiner's explicit reliance on equivalency in "considering" the processor of Jacobs as a CPG while it is equally clear that, substantively, the invention is not an equivalent of the processor of Jacobs and that Jacobs is entirely silent in regard to simulation of any biological neuron, much less a CPG or making the CPG responsive to input signals supporting
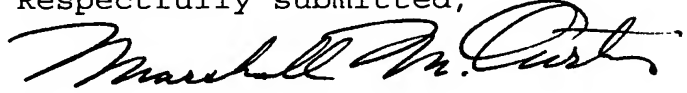
adaptive alteration of the behavior of the CPG and an extremely wide variety of applications in the diverse areas of robotics, protheses and other medical treatment devices as disclosed. By the same token, the Examiner has clearly failed to make a *prima facie* demonstration of anticipation of any claim in the application and includes numerous dependent claims within the rejection which recite features such as specific references to neurons (e.g. claim 6) or oscillators (e.g. claim 12) and combination with biological systems (e.g. claim 34). Therefore, it is respectfully submitted that the asserted ground of rejection is in error and untenable even in regard to the claims as originally filed and even more so in view of the clarifying amendments made above. The statement of the rejection is improper on its face and the processor of Jacobs is clearly not an equivalent of the CPG in accordance with the invention which provides substantial advantages thereover, particularly in terms of size, power requirements and performance. Accordingly, reconsideration and withdrawal of the ground of rejection base on Jacobs are respectfully requested.

Since all rejections, objections and requirements contained in the outstanding official action have been fully answered and shown to be in error and/or inapplicable to the present claims, it is respectfully submitted that reconsideration is now in order under the provisions of 37 C.F.R. §1.111(b) and such reconsideration is respectfully requested. Upon reconsideration, it is also respectfully submitted that this application is in condition for allowance and such action is therefore respectfully requested.

A petition for a two-month extension of time has been made above. If any further extension of time is required for this response to be considered as being timely filed, a conditional petition is hereby made for

such extension of time. Please charge any deficiencies in fees and credit any overpayment of fees to Attorney's Deposit Account No. 50-2041.

Respectfully submitted,

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